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TO: Each Supervisor

FROM: Jonathan E. Fielding, M.D., M.P.H. Jonathan E Fielding
Director and Health Officer

SUBJECT: **PROPOSITION 86: HEALTH IMPACTS IN LOS ANGELES COUNTY**

The California Department of Health Services' Tobacco Control Section has released an estimate of statewide impacts on tobacco use were Proposition 86 approved by the voters. That report is attached. In response to questions about what the potential impact would be in Los Angeles County, we developed the estimates below using the same methodology as the state after confirming through an independent assessment that this was an appropriate methodology for this purpose. A summary of our approach is also attached.

The estimates represent the projected reductions in smoking and associated health benefits that would result from the price increase in tobacco products. The estimates do not include the anticipated health benefits that would result from expanded health care services and other health-related programs funded through the initiative.

Short-term[i] Impact of Proposition 86 in Los Angeles County:

- The prevalence of smoking among adults would decrease from 14.6% to 12.7%, resulting in 140,000 fewer adult smokers.
- The prevalence of smoking among youth aged 14-17 years would decrease from 11.8% to 6.8%, resulting in 31,000 fewer youth smokers.

Long-term[ii] Impact of Proposition 86 in Los Angeles County:

- Prop 86 would prevent an estimated 172,000 children (under age 18) from becoming future smokers, resulting in 37,000 fewer smoking-related deaths.
- Prop 86 would prevent an additional 29,000 smoking-related deaths because of the reduced smoking prevalence in the county's adult population.
- Approximately $4.0 billion would be saved in healthcare costs:
    - For the current population of adults, $1.2 billion would be saved over their lifetimes because of the reduced smoking prevalence.
    - For the current population of children, $2.8 billion would be saved over their lifetimes because fewer children would become adult smokers.

Please let me know if you have any questions or need additional information.

JEF:lma

Attachments

c: Chief Administrative Officer
County Counsel
Executive Officer, Board of Supervisors

[i] The California Department of Health Services, Tobacco Control Section defines "short-term" as the first year after the tax increase.
[ii] "Long-term" is defined as the future lifetimes of those in the County's current population.

Economic and Health Effects of a State Cigarette Excise Tax Increase in California

Prepared on: May 26, 2006

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Introduction

Proposition (Prop) 99 in 1988 raised the excise tax 25 cents per pack of cigarettes and subsequently established the Tobacco Control Program. In 1992, the Legislature increased the tobacco tax by two cents to fund breast cancer prevention and screen efforts. In 1999, California voters passed Prop 10, which raised the cigarette excise tax by 50 cents per pack to fund early childhood education and children's health insurance programs.

Even with these major tax increases in the past two decades, the price of a pack of cigarettes in California remained moderate, averaging $3.95 per pack in 2004, and currently ranks 23rd in the nation. At the end of 2005, a coalition made up of 15 organizations including the American Cancer Society, American Lung Association, American Heart Association, The California Hospital Association, and Campaign for Tobacco Free Kids sponsored and supported an initiative to raise the state's cigarette tax by $2.60 per pack. The new revenue would be used to fund hospital emergency care services, nursing education, community clinics, tobacco cessation services, children's health insurance, tobacco use prevention, education, and enforcement programs, as well as other health programs. If passed, the tax increase would result in significant economic and health impact based on the findings from previous studies (United States [U.S.] Department of Health and Human Services, 2000).

In this study, we focus on the direct impact of the tax rather than the program impact of increases in revenue for tobacco control efforts. We examine the effects a $2.60 increase in state cigarette excise tax would have on smoking prevalence, cigarette consumption, long-term health effects, and state revenues. We used previous studies conducted by Ong and his colleagues (Ong, Alamar, Glantz, 2003) as a guideline to perform the analysis. Frank J. Chaloupka, Ph.D., a well known economics expert on tobacco taxes, helped us modify the methodologies. We also received clarification from Eric Lindblom and Matt Myers at the Campaign for Tobacco Free Kids who also had prepared previous analyses. Table 1 provides a synopsis on the variables addressed.

Average Cigarette Price Per Pack after the Tax Increase

The average price per pack of cigarettes in 2004 was $3.95, including an 87-cent California excise tax. The proposed excise tax is $2.60 per pack, which would inflate the average price of a pack of cigarettes to $6.55, a 65.82 percent increase. Based on the history of tax increases on cigarettes in the U.S., it is anticipated that the additional tax would be passed onto consumers (Advocacy Institute, 1998).

Table 1 – Tax increase effects analysis outline

Effects of tax increase on demand for cigarette smoking
1. Total reduction in cigarette consumption
   a. Due to fewer smokers
   b. Due to fewer cigarettes consumed by remaining smokers
2. Smoking prevalence change among adults
   a. Reduction in number of smokers
3. Smoking prevalence change among youth
   a. Short term reduction in number of smokers
   b. Number of youth who will not become adult smokers

Effects of tax increase on long-term health outcomes
1. Number of adult smokers prevented from dying from tobacco-related diseases
2. Number of youth prevented from dying from tobacco-related diseases
3. Health cost savings

Effects of tax increase on revenue
1. Total revenue change
2. Total sales revenue change
3. Increase of sales tax revenue towards state General Fund (GF)

Effects of Tax Increase on Demand for Adult Cigarette Smoking

Price Elasticity of Demand

We used published price elasticity of demand for the cigarette price change to calculate the effect of cigarette price increase on demand for cigarettes. Price elasticity of demand (PE_d) is the percentage change in demand due to one percent change in price.

$$PE_d = \frac{\Delta C(\%)}{\Delta P(\%)} \quad (1)$$

where

PE_d = price elasticity of cigarette demand
$\Delta C(\%)$ = % change in demand of cigarettes
$\Delta P(\%)$ = % change in cigarette price

In other words:

$$\textit{Price elasticity of cigarette demand} = \frac{\%\ \textit{change in demand of cigarettes}}{\%\ \textit{change in cigarette price}}$$

To measure the actual change in demand of cigarettes, formula (1) can be transformed as:

$$\Delta C = \Delta P \times PE_d \qquad (2)$$

or

% change in demand of cigarettes = % change in cigarette price × price elasticity

For example, a price elasticity of cigarette demand of –0.20 and an increase price of 65.82 percent will result in a reduction of demand for cigarettes by 13.16 percent (65.82% × [–0.20] = –13.16%).

Previous studies calculated price elasticity of the cigarette price change using various data sources. Most of the studies focused on short-term price elasticity and yielded different results. For this paper, we took advantage of a summary of the price elasticity results in a review article published in *Reducing Tobacco Use: A Report of the Surgeon General, 2000*, page 322-329 (U.S. Department of Health and Human Services, 2000). In this review, the authors listed 34 econometric studies on price elasticity, which reported 40 versions of price elasticity, ranging from –0.14 to –1.12.

Coincidentally, the mean, median, and mode of these numbers are all the same: –0.40. We used –0.40 as the overall price elasticity of cigarette demand in this paper. Note that price elasticity may not be a constant in relation to the amount of change in the cigarette price. Previous cigarette tax increases have never been as high as the proposed tax increase analyzed here. The price elasticity may fluctuate to a higher or lower level at the proposed price increase. Also, price elasticity reflects the immediate effect of cigarette price increase; the reported estimates are short-term changes of cigarette consumption, smoking prevalence, and revenue in the first year after the tax increase.

Short-term total reductions in cigarette consumption after the tax increase

According to the function of price elasticity in formula (2), the percentage of total consumption change is derived by multiplying the percentage change in price (65.82%) by –0.40, which results in a decline of 26.33 percent.

$$65.82\% \times (-0.40) \approx -26.33\%$$

The total reduction in cigarette consumption after the tax increase can then be calculated as the packs of cigarettes consumed before the tax increase (1,186 million cigarette packs in 2004) multiplied by the percentage of total consumption change (–26.33%), which would result in a decrease of more than 300 million packs of cigarettes (312,263,291), as shown in formula (3)

$$\Delta C_T = C_T \times \Delta C(\%) \qquad (3)$$

where

ΔC_T = Change in total packs of cigarettes consumed after a tax increase
C_T = Cigarette consumption before the tax increase
$\Delta C(\%)$ = percentage change of cigarette consumption

$$\Delta C_T = 1{,}186{,}000{,}000 \times (-26.329114\%) = -312{,}263{,}291$$

A price increase will result in both fewer people smoking (smoking prevalence) and fewer cigarettes consumed by continuing smokers. The change (reduction) in cigarette consumption after the tax increase would result from two sources:
1) Consumption decrease due to fewer smokers; and
2) Fewer cigarettes consumed among the remaining smokers.

Based on the results from available studies that used individual-level data, it appears that about half of the total consumption decline is related to the cigarette smoking prevalence change and the other half is related to fewer cigarettes consumed by the remaining smokers. Consequently, as a result of the $2.60 tobacco tax increase, there would be a reduction of 156 million packs of cigarettes consumed due to fewer smokers, and there would be another reduction of 156 million packs of cigarettes consumed as a result of the remaining smokers smoking fewer cigarettes.

Short-term reductions in smoking prevalence and number of adult smokers after the tax increase

The percentage decline in smoking prevalence (smoking participation) equals the percentage of the total consumption decline multiplied by the proportion that is attributable to fewer smokers (or declined smoking prevalence; formula 4).

$$\Delta SP(\%) = \Delta C(\%) \times p_{sp} \qquad (4)$$

where

$\Delta SP(\%)$ = percentage change in smoking participation
$\Delta C(\%)$ = total percentage change in cigarette consumption
p_{sp} = proportion of cigarette consumption change due to decreased smoking participation

In this case,

$$\Delta SP(\%) = \Delta C(\%) \times p_{sp} = (-26.329114\%) \times 0.5 = -13.164557\% \approx -13.16\%$$

In other words, there would be a 13.16 percent decrease in smoking prevalence after a $2.60 tax increase, which translates to a significant number of fewer smokers. In 2005, the estimated California adult population was 27.3 million. The cigarette smoking prevalence rate in adults in 2005 was 14.0 percent. So there were about four million adult smokers (3,814,091) in California in 2005. A 13.16 percent decrease represents a half million fewer adult smokers (502,108) in California. In the short term, the smoking prevalence after the tax increase would be 12.16 percent (14.0% x [1-0.1316]).

Short-term reductions in smoking prevalence and number of youth smokers after the tax increase

Previous studies showed different price elasticity patterns on cigarette consumption among youth. The consensus is that youth and young adults are more sensitive to cigarette price increases than middle aged and old adults. According to the existing research and recommendations from experts, we used -0.65 as the average price elasticity of change in smoking prevalence for youth 17 and younger.

Again, according to the function of price elasticity in formula (2), the percentage of prevalence change is derived by multiplying the percentage change of price (65.82%) by price elasticity (–0.65), which is a decline of 42.78 percent.

$$65.82\% \times (-0.65) \approx -42.78\%$$

In 2004, the smoking prevalence was 13.2 percent for California high school students (approximate age 14-17) and 3.9 percent for middle school students (approximate age 11-13). After the $2.60 tax increase, the smoking prevalence would be 7.6 percent (13.2% × [1–0.4278]) for high school students and 2.2 percent (3.9% × [1–0.4278]) for middle school students, which translates to more than 120,000 (124,306) fewer smokers among high school age youth, and nearly 30,000 (28,462) fewer smokers among middle school age youth.

Long-term reductions in number of kids 17 and younger prevented from becoming regular smokers in their adulthood

In the long run, a $2.60 tax increase on cigarettes would prevent youth from becoming smokers when they enter adulthood as shown in the declined smoking prevalence both in youth and in young adult population. Pursuant to the recommendation of Frank J. Chaloupka, Ph.D., steps were taken to calculate the impact of the tax increase on the projected number of smokers among the current 0-17 year old cohort.

First, the number of youth in the 0-17 year old cohort who are expected to become smokers in adulthood was calculated with the assumption that smoking prevalence would not change. This assumption is from methods used by the Centers for Disease Control and Prevention (CDC) to project the number of tobacco-related deaths among the youth cohort (CDC, 1996). The average smoking prevalence of current 18-30 year olds was used to estimate the future smoking for the 0-17 year old cohort. In 2005, smoking prevalence for 18-30 year olds was 17.78 percent (Male: 23.07%; Female: 11.78%). The California population of youth who were 0-17 years old in 2005 was 9,660,111. Multiplying the population size and the smoking prevalence, we project that about 1.7 million of the youth (1,717,568) would become smokers in their adulthood if the smoking prevalence continues at the current value. As mentioned above, a $2.60 tax increase will have the price elasticity of -0.65 for youth not older than 17 years old, and will decrease the smoking prevalence in this cohort by 42.78 percent; the number of youth projected to become smokers would be reduced by 42.78 percent. That translates to a decline of 734,858 individuals. In other words, the $2.60 tax increase alone would prevent more than 700,000 youth aged 0-17 from becoming smokers in adulthood.

Effects of Tax Increase on Long-Term Health Outcomes

Number of smokers prevented from dying from tobacco-related diseases and number of youth prevented from dying from tobacco-related disease

The proposed excise tax increase would reduce smoking prevalence as well as cigarette consumption among the remaining smokers. For simplicity sake, we have focused on the reduction in smokers and made the assumption that current smokers would never quit. The impact of the tax would have immediate effects and long-term effects on health care. Although measuring immediate effects on health outcomes is plausible, we focused on long-term effects. We calculated the effects of a tax increase of $2.60 on long-term health outcomes using detailed probabilities of dying by smoking status based on a research article from the Cancer Prevention Study II (CPS II) described in the 1990 Surgeon General Report (U.S. Department of Health and Human Services, 1990).

Table 2 lists the estimated probabilities of dying in the next 16.5 year interval by age, gender, and smoking status (U.S. Department of Health and Human Services, 1990). Using these results, we calculated the reduced deaths due to more quitters after the cigarette tax increase in California. Although positive health outcomes would exist, we did not include the potentially reduced deaths due to fewer cigarettes consumed among the remaining smokers after the tax increase. This calculation is outside the scope of simple mathematical modeling.

Table 3 presents the estimated lives saved due to more quitters after the $2.60 cigarette tax increase in California. As mentioned above, more than a half million smokers are expected to quit soon after the tax increase. To assess the impact of the $2.60 cigarette tax increase, we first separated the half million expected quitters into five year age groups from 18 to 74 using the age distribution of smokers from the California Tobacco Survey (CTS) in 2002. We did not use the age distribution of quitters because quitting behavior caused by the tax increase is very different from the usual quitting behavior. We assumed that the proposed tax increase would have an equal immediate effect on quitting across all age groups. Therefore, the age distribution of expected quitters will be the same as the age distribution of current smokers. We then divided the expected quitters into two groups based on the amount they smoked before quitting:

quitters who smoked 1-20 cigarettes/day and quitters who smoked greater than 20 cigarettes per day based on the distribution of amount smoked by age in the 2002 CTS.

Table 2 – Estimated probability of dying in the next 16.5-year interval by age, gender, smoking status, and amount smoked

Age at quitting or at start of interval	Never smokers	1-20 cig/day		>20 cig/day	
		Continuing smokers	Former smokers	Continuing smokers	Former smokers
Male					
40-44	0.05	0.11	0.05	0.14	0.07
45-49	0.07	0.18	0.10	0.22	0.11
50-54	0.11	0.27	0.17	0.31	0.21
55-59	0.18	0.39	0.28	0.46	0.33
60-64	0.30	0.54	0.46	0.56	0.51
65-69	0.46	0.68	0.59	0.67	0.64
70-74	0.40	0.61	0.55	0.58	0.51
Female					
40-44	0.03	0.06	0.03	0.08	0.04
45-49	0.04	0.09	0.06	0.13	0.05
50-54	0.07	0.14	0.07	0.19	0.09
55-59	0.11	0.21	0.13	0.27	0.15
60-64	0.18	0.3	0.19	0.38	0.32
65-69	0.30	0.46	0.39	0.52	0.32
70-74	0.26	0.41	0.27	0.45	0.31

Abstracted from the Health Benefits of Smoking Cessation, a report of the Surgeon General 1990. Page 97

Since the 1990 Surgeon General Report only provides the probability of dying in the next 16.5-year interval for those aged 40 or higher, we organized our calculation of reduced deaths for:

1. Cohorts 40 years old or above at quitting, in the first 16.5-year interval;
2. Cohorts 40 years old or above at quitting, in the second 16.5-year interval;
3. Adult cohorts under 40 years old at quitting, in the first 16.5-year interval;
4. Adult cohorts under 40 years old at quitting, in the second 16.5-year interval;
5. Youth cohort 0-17 years old prevented becoming smokers in adulthood, in the first 16.5-year interval; and
6. Youth cohort 0-17 years old prevented becoming smokers in adulthood, in the second 16.5-year interval.

Below, calculations for reduced deaths are described for each of the six cohorts.

1. Cohorts 40 years old or above at quitting, in the first 16.5-year interval

   The reduced deaths for this group can be calculated as

$$\Delta D_i = n_i \times (p_{ci} - p_{fi}) \qquad (5)$$

Where

ΔD_i = Reduced deaths of a specific gender-age-cigarette consumption group
n_i = Number of quitters in the group
p_{ci} = probability of dying for continuing smokers in the group
p_{fi} = probability of dying for former smokers in the group

2. Cohorts 40 years old or above at quitting, in the second 16.5-year interval

   Naturally, age progression was taken into consideration in the calculation for the reduced deaths in the second 16.5 years. With an average life expectance at 75 years in California, the older cohorts of 60-64, 65-69, and 70-74 years (at time of quitting due to tax increase) would die out of the lifetable calculation, but the cohorts of 40-44, 45-49, 50-54, and 55-59 years (at time of quitting) would march into cohorts 55-59, 60-64, 65-69, and 70-74 years in approximation. Therefore, the reduced deaths in the second 16.5 years of these four cohorts were calculated similar to the formula (5) as:

$$\Delta D_{i2} = n_{i2} \times (p_{ci2} - p_{ni2}) \qquad (6)$$

where

ΔD_{i2} = Reduced deaths in the second 16.5 years for cohorts of 40-59 years old at quitting
n_{i2} = Number of survived quitters at the start of the second 16.5-year interval
p_{ci2} = probability of dying for continuing smokers during the second 16.5-year interval
p_{ni2} = probability of dying for never smokers during the second 16.5-year interval

where

$$n_{i2} = n_i \times (1 - p_{ci}) \qquad (7)$$

where

n_i = Number of quitters in the group
p_{ci} = probability of dying for continuing smokers in the group

Please notice that the probability of dying among the 40-59 year old cohort during their second 16.5-year interval approximately equals to the probability of dying among the 55-74 year old cohort in the next 16.5 years. Also, the difference between probability of dying for continuing smokers and that of never smokers (but not that of former smokers) is used to calculate the reduced deaths for the second

16.5-year interval. The reason is that former smokers' risk of smoking-related mortality would be almost the same as never smokers after 15 years of cessation (U.S. Department of Health and Human Services, 1990).

3. Cohorts under 40 years old at quitting, in the first 16.5-year interval

4. Cohorts under 40 years old at quitting, in the second 16.5-year interval

First, we assumed that the reduced deaths would not happen until the expected quitters of less than 40 years old at quitting turn into 40 years. By then, they would follow the probability of dying within the next 16.5 years as a 40-44 year old cohort, and in the second 16.5 year interval would follow the probability of dying as a 55-59 year old cohort. Based on this, the reduced deaths during the first 16.5 years interval were calculated as:

$$\Delta D_{i<40} = n_i \times (p_{c40\text{-}44} - p_{f40\text{-}44}) \qquad (8)$$

where

$\Delta D_{i<40}$ = Reduced deaths in the first 16.5-year interval for age groups <40 years at quitting
n_i = Number of quitters in the group
$p_{c40\text{-}44}$ = Probability of dying of continuing smokers of the 40-44 years old group
$p_{f40\text{-}44}$ = Probability of dying of former smokers of the 40-44 years old group

Similarly, reduced deaths in the second 16.5 years for cohorts 18-39 years at quitting were calculated as:

$$\Delta D_{i2<40} = n_{i2} \times (p_{c55\text{-}59} - p_{n55\text{-}59}) \qquad (9)$$

where

$\Delta D_{i2<40}$ = Reduced deaths in the second 16.5-year interval for age groups < 40 years at quitting
n_{i2} = Number of survived quitters in the group
$p_{c55\text{-}59}$ = Probability of dying for continuing smokers of the 55-59 years old group
$p_{n55\text{-}59}$ = Probability of dying for never smokers of the 55-59 years old group

where

$$n_{i2} = n_i \times (1 - p_{c40\text{-}44}) \qquad (10)$$

where

n_i = Number of quitters in the group
$p_{c40\text{-}44}$ = Probability of dying for continuing smokers of the 40-44 years old group

5. Youth cohort 0-17 years old prevented becoming smokers in adulthood, in the first 16.5-year interval; and
6. Youth cohort 0-17 years old prevented becoming smokers in adulthood, in the second 16.5-year interval.

   The calculation of reduced deaths among current youth cohort (0-17 years) is similar to the young adults, except that all youth who would be prevented from becoming smokers because of the $2.60 tax increase were treated as "nonsmokers" in terms of probability of dying.

   When youth in the never smokers cohort that were prevented by the tax increase turn 40, they would follow the probability of dying of 40-44 years in the first 16.5 years and then the probability of dying of 55-59 years in the second 16.5 years. Based on this, the reduced deaths during the first 16.5 years interval were calculated as:

$$\Delta D_{0\text{-}17} = n_{0\text{-}17} \times (p_{c40\text{-}44} - p_{n40\text{-}44}) \qquad (11)$$

   where

   $\Delta D_{0\text{-}17}$ = Reduced deaths in the first 16.5-year interval for age group 0-17 years old at tax increase
   $n_{0\text{-}17}$ = Number of youth prevented to become smokers in adulthood
   $p_{c40\text{-}44}$ = Probability of dying of smokers of the 40-44 years old group
   $p_{f40\text{-}44}$ = Probability of dying of never smokers of the 40-44 years old group

   Similarly, the reduced deaths during the second 16.5 years interval were calculated as:

$$\Delta D_{0\text{-}17/2} = n_{0\text{-}17/2} \times (p_{c55\text{-}59} - p_{n55\text{-}59}) \qquad (12)$$

Table 3 lists all these reduced deaths by gender, age, and amount smoked. Based on calculations using detailed probability of dying, more than 120,000 lives (120,241) of adult quitters would be saved due to the $2.60 tax increase. In addition, 187,788 deaths of youth 0-17 years old when the tax increase would be averted because the proposed tax increase would prevent them from becoming cigarette smokers. This effects more than 300,000 (308,029) deaths averted as the result of the $2.60 tax increase.

Table 3. Estimated lives saved due to more quitters after tax increase in California

Age at quitting	No. of quitters	Quitters who smoked 1-20 cig/day: No. of light quitters	Reduced death after the cohort turn in 40+ years: In the 1st 16.5 years	Reduced death after the cohort turn in 40+ years: In the 2nd 16.5 years	Quitters who smoked >=20 cig/day: No. of heavy quitters	Reduced death after the cohort turn in 40+ years: In the 1st 16.5 years	Reduced death after the cohort turn in 40+ years: In the 2nd 16.5 years
Male							
18-24	57,291	28,400	1,704	5,666	28,891	2,022	7,523
25-29	35,359	17,821	1,069	3,555	17,538	1,228	4,567
30-34	37,327	19,321	1,159	3,855	18,006	1,260	4,689
35-39	37,231	23,102	1,386	4,609	14,129	989	3,679
40-44	42,042	26,797	1,608	5,346	15,245	1,067	3,970
45-49	29,866	19,144	1,531	4,135	10,722	1,179	2,481
50-54	24,231	15,409	1,541	2,814	8,822	882	1,464
55-59	18,610	9,193	1,011	1,390	9,417	1,224	1,136
60-64	10,233	6,787	543	Die out	3,446	172	Die out
65-69	6,029	4,524	407	Die out	1,505	45	Die out
70-74	3,552	2,169	130	Die out	1,383	97	Die out
Subtotal			12,090	31,369		10,167	29,508
Total males							83,134
Female							
18-24	30,278	15,964	479	1,549	14,314	573	2,199
25-29	18,425	8,739	262	848	9,686	387	1,488
30-34	22,073	8,288	249	804	13,785	551	2,117
35-39	26,384	7,818	235	758	18,566	743	2,852
40-44	29,113	8,332	250	808	20,781	831	3,192
45-49	20,036	5,743	172	648	14,293	1,143	2,716
50-54	16,373	3,778	264	562	12,594	1,259	2,521
55-59	14,698	4,186	335	546	10,512	1,261	1,698
60-64	10,513	3,421	376	Die out	7,092	426	Die out
65-69	6,675	1,843	129	Die out	4,832	966	Die out
70-74	6,494	1,694	237	Die out	4,800	72	Die out
Subtotal			2,988	6,523		8,813	18,782
Total females							37,107
Total saved lives							**120,241**

Health care savings

The reduced number of smokers resulting from the $2.60 cigarette tax increase would alleviate the burden of health costs to the government and individuals, especially in the long run. However, the methodology to measure the difference in the average costs of smokers versus nonsmokers or former smokers has not been well-established. The best estimate is from Hodgson's (Milbank Quarterly) study in 1992, which determined the weighted average difference in lifetime health costs between smokers and nonsmokers were $9,292. Based on the methodology used by the CDC (CDC, 2002 - Tobacco Control State Highlights, 2002: Impact and Opportunity), the dollar amount ($9,292) is inflated to represent 2002 dollars. As a result, the average difference in lifetime health costs between smokers and nonsmokers is $16,301.

As calculated in the previous section, over 700,000 (734,858) youth 0-17 years old will become averted smokers as a result of the $2.60 tax increase. Multiplying this number with the average health cost difference between smokers and nonsmokers, we foresee a nearly $12 billion long-term health care savings (734,858 × $16,301 = $11,978,921,799).

Previous research did not provide a reliable measure of lifetime health costs of former smokers. Therefore, for this analysis, we estimated the costs of former smokers by applying the relative probability of dying from tobacco-related diseases to the health costs of smokers, which were measured in Hodgson's study. Based on CDC's estimation, current smokers have a 50 percent chance of dying from smoking, and former smokers have a 10 percent to 37 percent chance of dying from smoking. The former smokers' relative risk of dying from smoking would then be 0.2 (10/50) to 0.74 (37/50) in comparison to current smokers. Applying this range of relative risk to the health care costs of smokers reported in Hodgson's study, we estimated that the health care cost savings from stopping smoking would be $4,700 to $13,000 per former smoker. Based on the current smoking population distribution, the average savings for former smokers compared to continuing smoking would be $8,934 in 2002 dollars.

According to the previous section, about a half million smokers (502,108) would quit after a $2.60 cigarette tax increase. The long-term health care cost savings would be calculated by multiplying the number of quitters with average savings for former smokers; this calculates to approximately $4.5 billion in long term health care savings (502,108 × $8,934 = $4,485,832,872).

Combining the cost savings from youth averted from becoming smokers in adulthood and from adult smokers who stop smoking after the $2.60 tax increase, we concluded that the tax increase would save the state of California and individuals a total of $16.5 billion in health care expenses ($11,978,921,799 + $4,485,832,872 = $16,464,754,671).

Effects of Tax Increase on Revenue Change

The proposed $2.60 tax increase would reduce smoking as discussed in the previous sections. However, this increase will also result in significant more tax revenue for the state of California.

The cigarette consumption in 2004-05 fiscal year (FY) is approximately 1,186 million packs. As calculated in the previous section, nearly 300 million fewer packs of cigarettes would be consumed in California after the tax increase. The remaining number of cigarettes consumed would be around 900 million packs (1,186,000,000 – 312,263,291 = 873,736,709).

Of the current price of a cigarette pack, 87 cents are excise tax. With the new proposed $2.60 tax increase, the total tax would be $3.47. The total revenue from the cigarette tax per pack would be the number of packs consumed (874 millions) multiplied by $3.47, which is equal to more than 3 billion dollars ($3,031,866,380). The revenue from the new tax ($2.60) would be approximately $2.3 billion ($2,271,715,443).

In addition, state sales tax would also be inflated due to the higher retail price of cigarettes, after adjusting for the cigarette consumption decline. The portion of the state sales tax that goes towards the state GF is equal to a tax rate of five percent of the sales. The increase of sales tax revenue can be calculated by multiplying the difference between the new total cigarette sale revenue and current cigarette sale revenue by 0.05, or as the following equation:

$$\Delta R_{ST} = (R_{T1} - R_{T2}) \times 0.05 \qquad (14)$$

where

ΔR_{ST} = increase of sales tax revenue towards state GF
R_{T1} = total sales revenue after the tax increase
R_{T2} = total sales revenue before the tax increase

The total cigarette sales revenue in FY 2004-05 was the product of the packs of cigarettes consumed (1,186 million) and the average cigarette pack price ($3.95), which is equal to $4.68 billion ($R_{T2}$; 1,186,000,000 × $3.95 = $4,684,700,000). Similarly, the total cigarette sales revenue after the $2.60 tax increase is calculated by multiplying the remaining pack cigarette consumption (873,736,709) by the new price ($6.55), which would be equal to $5.72 billion ($R_{T1}$; 873,736,709 × $6.55 = $5,722,975,443). The increase of revenue can then be calculated by subtracting the current revenue from the new revenue. This equals $1.1 billion ($5,722,975,443 – $4,684,700,000 = $1,08,275,444). The increase of sales tax revenue for the state GF can then be calculated by multiplying the change of cigarette sales revenue by 0.05, which would be equal to $58.6 million. The calculation can also be shown using formula (14):

$$\Delta R_{ST} = (R_{T1} - R_{T2}) \times 0.05 = (\$5{,}722{,}975{,}443 - \$4{,}684{,}700{,}000) \times 0.05 = \$51{,}913{,}772$$

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Health and Economic Impact of Proposition 86: Analytic Methods and Assumptions

Introduction

This paper describes the analytic methods and assumptions underlying the estimates of the health and economic impact of Proposition 86, which raises California's cigarette tax by $2.60 per pack. Methods and assumptions used to estimate short-term and long-term impacts for Los Angeles County adults and youth are described separately. A detailed discussion of the analytic methods can be found in the report titled, "Economic and Health Effects of a State Cigarette Excise Tax Increase in California" prepared by the Tobacco Control Section, California Department of Health Services.

Short-Term[1] Impact of Proposition 86 in Los Angeles County – Adults

- The prevalence of smoking among adults would decrease from 14.6% to 12.7%, resulting in 140,000 fewer adult smokers.

According to the price elasticity function and the assumption that 50% of the decrease in total cigarette consumption is related to declining smoking prevalence, Proposition 86 would decrease prevalence by 13.16%. Based on the 2005 Los Angeles County Health Survey (LACHS), adult smoking prevalence would decrease from 14.6% to 12.7%. Correspondingly, the number of adult smokers would decrease by 13.6%, from 1,067,221 to 926,726 (140,495 fewer smokers).

Central assumptions of short-term impact estimates are that price elasticity is constant in relation to the amount of change in the cigarette price and that a 50% decline in total consumption can be attributed to prevalence change. A leading expert on the effects of price increases on cigarette consumption confirmed that both these assumptions are warranted.

Short-Term[1] Impact of Proposition 86 in Los Angeles County – Youth

- The prevalence of smoking among youth aged 14-17 years would decrease from 11.8% to 6.8%, resulting in 31,000 fewer youth smokers.

According to the price elasticity function and the assumption that 100% of the decrease in total cigarette consumption is related to declining smoking prevalence, Proposition 86 would decrease prevalence by 42.78%. Based on the 2005 Los Angeles Youth Behavior Risk Behavior Survey (YRBS), youth smoking (age 14-17) would decrease from 11.8% to 6.8%. Correspondingly, the number of youth smokers would decrease by 42.78%, from 73,808 to 42,233 (31,575 fewer smokers).

Central assumptions of short-term impact estimates are that price elasticity is constant in relation to the amount of change in the cigarette price and that a 100% decline in total consumption can be attributed to prevalence change. A leading expert on the effects of price increases on cigarette consumption confirmed that both these assumptions are warranted.

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[1] The California Department of Health Services, Tobacco Control Section defines "short-term" as the first year after the tax increase.

Estimates also assume that smoking prevalence obtain from the YRBS conducted in LAUSD schools is representative of youth prevalence in Los Angeles County. However, there is no youth smoking data to verify this assumption, raising the possibility that YRBS prevalence is upwardly biased, which would inflate the short-term impact estimates. To counterbalance this potential bias, youth smokers under age 14 were not included in the calculations.

Long-Term[2] Impact of Proposition 86 in Los Angeles County – Adults

- Prop 86 would prevent an additional 29,000 smoking-related deaths because of the reduced smoking prevalence in the county's adult population.

Death Prevented. A life table analysis approach using probabilities of dying from the Cancer Prevention Study II (CPS II) was used to estimate number of deaths prevented. Key data elements from the 2005 LACHS data, such as the distribution of smokers by gender, age, and smoking frequency, were used in the life table calculations. Based on this analysis, 28,855 deaths would be prevented by Proposition 86.

The primary assumption of the life table calculations is that the probabilities of dying obtained from CPS II conducted from 1982-1988 are representative of current adult smokers. There is convincing evidence that mortality rates are increasing among smokers from more recent birth cohorts. This suggests that the estimated probability of dying estimates from the 1982 CPS II would likely be lower (i.e., more conservative) than a more recent birth cohort of smokers.

- For the current population of adults, $1.2 billion would be saved over their lifetimes because of the reduced smoking prevalence.

Health Care Savings. Estimates for health care savings are derived from multiplying the number of fewer smokers due to Proposition 86 times the average savings for each (140,495 X $8934.00 = $1.25 billion dollars). The central assumptions underlying the health care savings estimates include those described under "Short-Term Impact—Adults" in addition to the assumption the health care costs of former smokers can be estimated by applying their relative risk of dying (range .2 to .74) to the excess lifetime health costs of smokers ($16,301).

This assumption does not appear to be well founded. However, it is unlikely that the overall estimate of health care savings is upwardly biased as savings from indirect costs (productivity) were not included in the estimate. Max et al., 2002 show that 46% of the total costs for smoking in Los Angeles were from lost productivity.

Long-Term[2] Impact of Proposition 86 in Los Angeles County – Youth

- Prop 86 would prevent an estimated 172,000 children (under age 18) from becoming future smokers, resulting in 37,000 fewer smoking-related deaths.

Future Adult Smokers Prevented/Deaths Averted. Number of youth in 0-17 year old cohort expected to become smokers is based current smoking prevalence among 18-30 year olds multiplied by population size. The 2005 LACHS was used to provide estimates of these data

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[2] "Long-term" is defined as the future lifetimes of those in the County's current population.

elements. This number is multiplied by the estimated decrease in youth smoking prevalence (42.78%) to obtain the number of youths prevented from becoming smokers.

A life table analysis approach is used to estimate the number of future deaths prevented based on the number of youth prevented from becoming smokers. Key data elements from the 2005 LACHS data, such as the distribution of smokers by gender and smoking frequency, were used in the life table calculations. Based on this analysis, 37,569 future adult smoking-related deaths would be prevented by Proposition 86.

The central assumptions underlying these estimates include those described under "Short-Term Impact—Youth" in addition to the assumption that current smoking prevalence of 18-30 year olds is representative of future smoking of the 0-17 year old cohort. Given the decline in smoking prevalence among this age group seen over the past 10 years, using current smoking prevalence to describe likely future smoking prevalence of individuals 0-17 years of age will tend to inflate estimates of number of future adult smokers prevented and, corresponding, deaths averted.

- For the current population of children, $2.8 billion would be saved over their lifetimes because fewer children would become adult smokers.

Health Care Savings. Estimates for health care savings are derived from multiplying the number of future adult smokers prevented due to Proposition 86 times the average savings for each (171,965 X $16,301.00 = $2.80 billion dollars). The central assumptions underlying the health care savings estimates include those described under "Short-Term Impact—Youth" in addition to the assumption that the excess lifetime health care costs of smokers is $16,301. This estimate is based on a 1992 study by Hodgson. Although the study is very well done, it still leaves the estimate of excess health care costs for smokers based on a single study.